Journal of Pharmaceutical Research International

33(57B): 118-134, 2021; Article no.JPRI.78557
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

Prevalence and Predictors of Depression, Anxiety and Stress among Pharmacy Students from Umm Al-Qura University, Saudi Arabia

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i57B34036

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc. are available here: https://www.sdiarticle5.com/review-history/78557

Original Research Article

Received 07 October 2021
Accepted 13 December 2021
Published 14 December 2021

ABSTRACT

Introduction: There is an increasing concern about the effect of mental diseases on academic performance, especially among students from the health specialties. However, very limited studies were done on depression, anxiety, and stress among pharmacy students in Makkah. The current study aimed to determine the prevalence and predictors of depression, anxiety, and stress among pharmacy students from Umm Al-Qura University, Makkah, Saudi Arabia.
Methods: A cross-sectional study was conducted among pharmacy students from both genders in 2018/2019. A standardized self-administered data collection sheet was used. It contained information about the personal, socio-demographic data, the Depression Anxiety and Stress Scale (DASS-21), and Schutte Self-Report Emotional Intelligence (SSREI) scale. Descriptive and inferential statistics were done. Stepwise multiple logistic regression analyses were done. Adjusted odds ratios (aORs) and 95% confidence intervals were calculated.
Results: The prevalence of depression, anxiety, and stress among pharmacy students was high; 62.8%, 59.0%, and 49.2%, respectively. Younger students suffered more from stress compared to older students. In regression analysis, academic stress was associated with the increased risk of depression, anxiety, and stress. However, good general life satisfaction is a predictor of decreasing depression, anxiety, and stress. Better emotional intelligence is also a predictor of decreased

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depression (aOR = 0.195; 95% CI: 0.09-0.42) and stress (aOR = 0.4; 95% CI: 0.21-0.72). A longer duration of physical exercise is another predictor for lowering stress.
Conclusion: The prevalence of depression, anxiety, and stress was high among pharmacy students. Academic stress was a predictor for depression, anxiety, and stress. General life satisfaction and high EI were protective from the three mental illnesses. A longer duration of physical exercise is a predictor for decreasing stress. Screening programs are needed for the detection and management of depression, anxiety, and stress among pharmacy students. Psychosocial and academic support services are needed for the management of academic stress. Training courses and educational programs are needed for improving the EI of pharmacy students. Encourage the practicing a longer duration of physical activities is needed.

Keywords: Depression; anxiety; stress; prevalence; predictors; pharmacy students.

1. INTRODUCTION

Mental health is one of the most important determinants of quality of life and life satisfaction [1-6]. Poor mental health is a complex and common psychological problem among university students in both developed and developing countries [7]. Mental disorders ranked as the ninth cause of global burden of disease, 2017, and accounted for about 15% of the global burden of diseases, with their burden being higher than from all cancers. Mental illnesses are complicated, multi-factorial disorders that occur due to the interaction of personal and environmental conditions [8].

Depression and anxiety are the commonest mental illnesses in the world. Depression is presented by sadness, anxiousness, hopelessness, feeling of guilty, worthlessness, restlessness, loss of interests, fatigue, difficulty in concentration, reduced memory, sleep and eating problems, suicidal feelings or attempts. Anxiety is an unfavorable condition presented by fear accompanied by unwanted physical manifestations. It has negative impact on the daily function [8]. If stress persists for a long time or is of high intensity, an individual may collapse and may even lead to the development of physical and mental disorders [9,10].

Emotional Intelligence (EI) helps individuals to able to capture the differences in identifying, processing and regulating emotions. There is a significant link between the ability to manage emotions and the mental health of individuals [11]. General findings suggest that EI plays a role in protecting individuals against stress [9,10].

Health care schools have been long been recognized as having numerous stressors that can affect the well-being of students [12,13]. Generally, students from medical fields have reported being more suffering from depression, anxiety, and stress [14]. A study was done to identify the prevalence of depression, anxiety, and stress among male medical students at Najran University, Saudi Arabia, and reported high levels of such illnesses [15].

There are increasing concerns about the importance of mental health in academic life, especially among health care students. However, there are very limited studies done on them among pharmacy students in Makkah. The study aimed to determine the prevalence and predictors of depression, anxiety, and stress among pharmacy students from Umm Al-Qura University (UQU), Makkah.

2. METHODS

A cross-sectional study was conducted among pharmacy students at UQU, Makkah, during the educational year 2018/2019. Pharmacy students from both genders who completed the first year from both programs of Bachelor of Pharmacy (B Pharm) or Doctor of Pharmacy (Pharm D), who accepted to participate were recruited. A multi-stage stratified random sampling technique was used. Stratification considered the gender, educational program (Pharm-D or B-Pharm), and educational year. The sample size was determined using the formula for calculation sample from the cross sectional study [16,17].

$$n = \frac{Z^2 * p * q}{L^2}$$

Where “n” is the minimal calculated sample, “Z” is a constant =1.96 at 95% confidence level, and “P” was assumed to be 50 % (as the most conservative sample because there was no

previous similar study in Makkah), and "q" = 1-p = 0.5. So, the minimal estimated sample size to accomplish a precision of 0.05%, at 95% Confidence Interval (CI) was 384 students, which was increased to reach 400 participants for the stratification purpose.

A standardized self-administered data collection sheet was used to collect:

a. Personal & socio-demographic data (age, gender, marital status, etc.)
b. Habits like smoking and exercise practicing.
c. General life satisfaction: A question asked about general life satisfaction was included.

d. **Depression Anxiety and Stress Scale 21 (DASS-21)**

It is a self-report instrument consisting of 21 Questions with seven items in each scale. It is used to measure the negative emotional states of anxiety, stress, and depression. The responses are given on a 4-point of severity to rate the extent to which they have experienced each state over the past weeks, ranging from zero if "totally disagree" to 3 if "totally agree".

The total DASS score and each subscale were calculated. Finally, two multiplied the overall score of the DASS for matching with the original long version (DASS-42). The symptom severity levels ranged from "normal" to "extremely serious" [18]. According to the reliability scores (using Cronbach's alpha) the overall DASS-21 reliability is 0.93 (at the normative sample). This reliability scores are 0.88, 0.90 and 0.93 for depression, anxiety and stress, respectively [19]. Moreover, DASS-21 had overall good construct validity of 0.79 [20].

e. **Schutte Self-Reported Emotional Intelligence (SSREI)**

It is a scale of 5-point response scale ranging from 1 "strongly disagree" to 5 "strongly agree", containing a total of 33 questions asking about 4 sub-scales. These subscales are: Emotion Perception (EP), Managing Self-Relevant Emotions (MSE), Managing Others' Emotions (MOE) and Utilizing Emotion (UE). Higher scoring of the scale representing greater levels of EI trait. Total EI score was calculated, and the score ≥ 110 was considered above the average of EI.

Face & content validity of the data collection sheet were assessed by two experts.

2.1 Statistical Analysis

All Statistical Analysis was Performed by SPSS Version 22 (IBM, Armonk, NY, USA).

Descriptive statistics was done. Inferential statistics were used and Chi-square ($\chi 2$) was calculated to compare between categorical variables. Odds Ratios (ORs) and 95 % Confidence Intervals were determined. Furthermore, a stepwise multiple logistic regression model was constructed to determine the significant predictors of depression, anxiety and stress after controlling of confounding factors. Adjusted Odds Ratios (aORs), and 95 % Confidence Intervals (CI) were calculated. The level of significance for all statistical tests was set at P value ≤ 0.05.

3. RESULTS

The prevalence of depression, anxiety, and stress among pharmacy students according to symptom intensity (ranging from normal to extremely severe level) were 62.8%, 59.0%, and 49.2%, respectively. For students categorized with depression, 18%, 24.8%, 9%, and 11% suffered from mild, moderate, severe, and extremely severe degrees, respectively. Regarding anxiety, 7.5%, 20.8%, 12.2%, and 18.5% of them suffered from the same degrees, respectively. Concerning stress, 13.2%, 17.8%, 10.5% and 7.8% had the same levels, respectively.

Fig. (1) illustrates that females recorded a lower prevalence of depression (60.7%) compared to males (66.9%). However, females had higher percentages of severe and extremely severe levels compared to males. The rate of both severe and extremely severe was 22.6% among females compared to only 14.6% among males. A highly statistically significant difference was present regarding depression intensity ($P < 0.01$).

Female students reported a higher overall anxiety prevalence (60%) compared to males (57.9%). Moreover, both severe to extremely severe anxiety stress levels reported more among females (33.7%) than males (24.6%). However, there is a statistically significant difference between both genders regarding anxiety ($P > 0.05$) Fig. (2).

Fig. (3) demonstrates the prevalence and the intensity of stress among pharmacy students at UQU. Female students had a higher level of overall stress (50.7%) compared to males (46.2%). Moreover, severe to extremely severe stress levels were also more among female students (23.3%) compared to males (7.6%). A highly statistically significant difference was present ($X2$ =15.79, $P < 0.01$).

It is apparent from Table (1) that younger students (≤ 21 years) had a higher prevalence of depression (69.9%) compared to others (59.9%). Age was statistically associated with depression (OR=1.78; 95% CI: 1.18-2.69). A higher GPA was negatively associated with depression. Good achievers (GPA ≥ 3.5 out of 4) had a significantly lower prevalence of depression (53.7%) than others (67.0%) did. On the other hand, gender, marital status, education of both parents, and residency had no significant association with depression ($P > 0.05$). Students who suffered from academic stress had a much higher rate of depression (69.3%) compared to others (37.0%), with a highly statistically significant difference ($P < 0.001$). On the other hand, those who had a generally good life satisfaction were less liable to depression (OR=0.26; 95% CI: 0.15-0.43). Participants who obtained a high EI score were also markedly less liable to depression compared to others (OR= 0.22; 95% CI: 0.11-0.45).

Table (2) shows that smoking was not associated with depression (X^2= 2.16, $P > 0.05$). Furthermore, neither physical activity nor the number of practicing days per week had any significant association with depression. Concerning the duration of physical activity, students who practiced physical exercise for ≥ 30 minutes/day reported a lower prevalence of depression compared to others.

Concerning anxiety, Table (3) shows that younger students (≤ 21 years) had a higher prevalence of anxiety (64.0%) compared to others (54.7%). However, there is no statistically significant difference. Moreover, gender, marital status, type of program, and the educational year did not have any statistical association with anxiety. Furthermore, the education of both fathers and mothers and the residency had no significant association with anxiety ($P > 0.05$). Students who complained of academic stress were about 5 times more liable to have anxiety than others (OR=5.47; 95% CI: 3.17-9.40). On the other hand, students who had a general life satisfaction were significantly less liable to have anxiety (OR=0.39; 95% CI: 0.24-0.63) than others. Students who obtained a better EI score had a lower prevalence of anxiety than others. However, there is no significant association between anxiety and EI ($P > 0.05$).

Table (4) reveals that there is no statistical association between anxiety and smoking. There is also no significant association between practicing physical activity, frequency of practicing, or the duration of exercising with anxiety ($P > 0.05$).

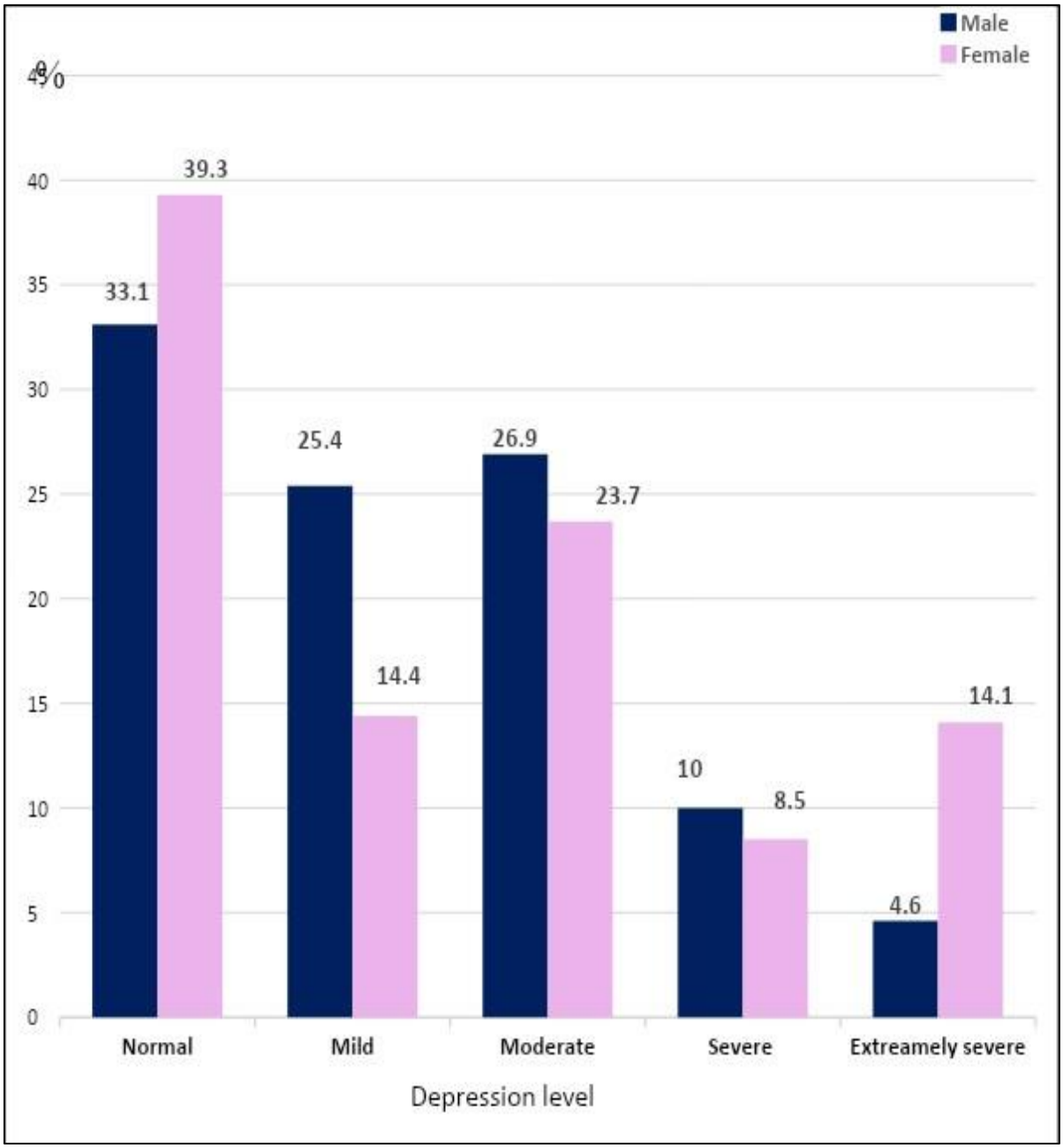
Table (5) demonstrates that younger students had a higher prevalence (58.6%) of stress compared to the older (41.1%), with a highly statistically significant difference (X^2= 12.16, P <0.001). Students who suffered from academic stress were about five times more likely to have stress than others (OR= 5.33; 95% CI: 2.95-9.61). Students who had exam anxiety were nearly 3 times more prone to stress (OR= 2.82; 95% CI: 1.68-4.73). Participants who reported having a good general life satisfaction also were less prone to stress (OR= 0.36; 95% CI: 0.23- 0.57). Similarly, better EI score was associated with a lower risk of stress (OR= 0.48; 95% CI: 0.25- 0.73). However, gender, marital status, type of the program, the educational year, GPA, parental education, and residency were not statistically associated with stress ($P > 0.05$).

Table (6) shows that each of smoking, physical activity, and the number of days of practicing physical activity (per week) were not statistically associated with stress ($P > 0.05$). On the other hand, there is a statistically significant association between stress and the duration of physical activity (X^2= 8.98, $P < 0.05$).

Table (7) shows that after controlling confounding factors in a logistic regression analysis, the first predictor of depression was having high EI (≥110) as it protected against depression (aOR= 019; 95% CI=0.09- 0.42). Having academic stress was the second predictor of depression (aOR= 3.32; 95% CI=1.94-5.67).This is followed by general life satisfaction that had a protective effect against depression (aOR=0.35; 95% CI= 0.19 - 0.61).

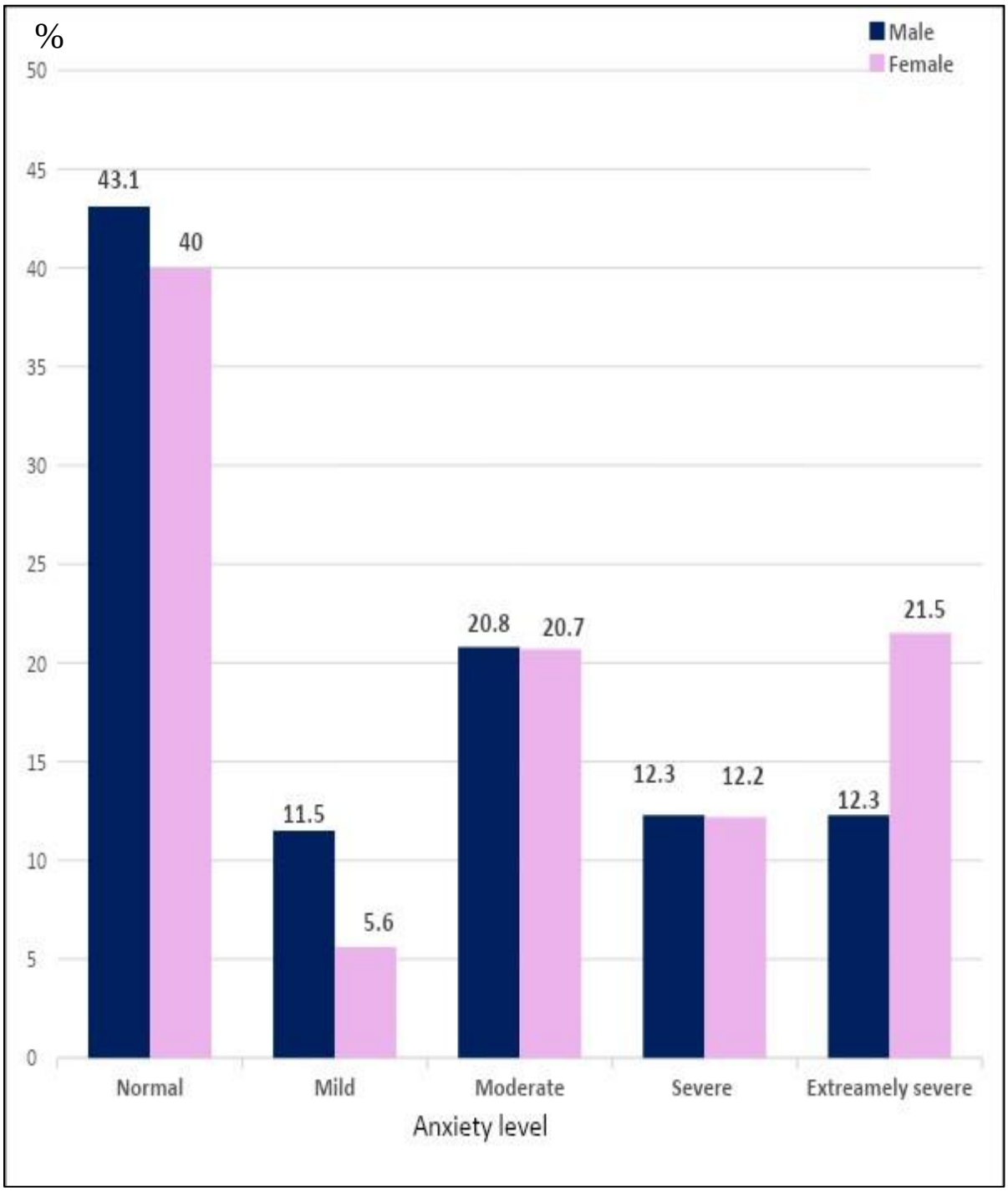
It is apparent also from the same table that the first predictor of anxiety was presence of academic stress (aOR=4.82; 95% CI=2.78, 8.37). The second predictor was the protective effect of having positive general life satisfaction (aOR=0.47; 95% CI=0.28, 0.78).

Logistic regression analysis also showed that the first predictor of stress was having an academic stress (aOR=4.39; 95% CI=2.62 -9.29). This is followed by the protective effects of having high EI score (aOR= 0.94; 95% CI= 0.21- 0.72), general life satisfaction (aOR 0.49, 95% CI= 0.30 - 0.81), aged > 21 years (aOR= 0.62; 95%CI=0.40- 0.96) and practicing exercise for a longer duration (aOR=0.28, 95% CI= 0.11 - 0.70).



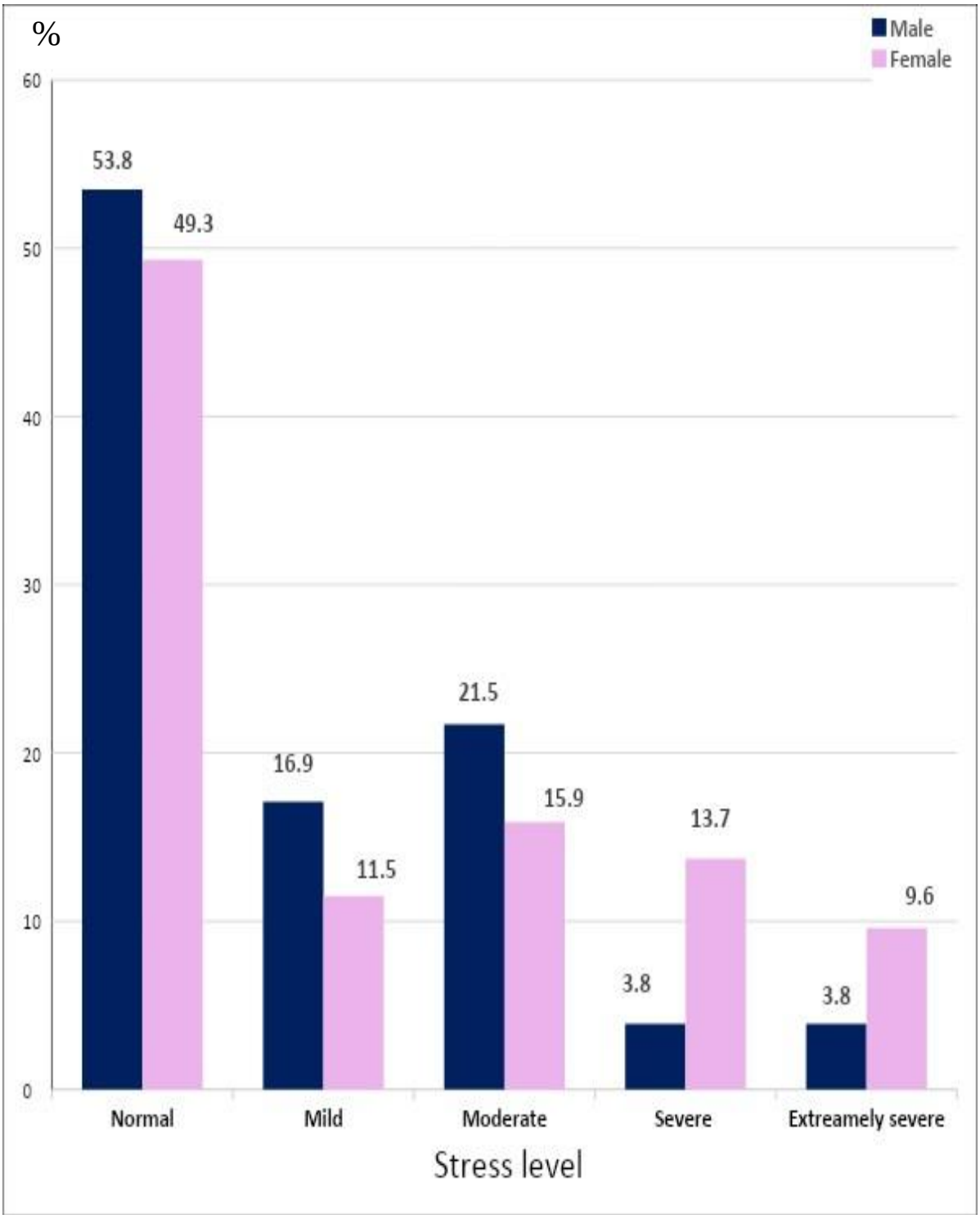
X2 = 14.45, P = 0.006

Fig. 1. Prevalence and intensity of depression among pharmacy students according to gender, Umm AL-Qura University



X^2 = 8.38, P = 0.07

Fig. 2. Prevalence and intensity of anxiety among pharmacy students according to gender, Umm Al-Qura University



X^2 = 15.79, P = 0.003

Fig. 3. Prevalence and intensity of stress among pharmacy students according to gender, Umm Al-Qura University

Table 1. Relationship between depression and personal and socio-demographic characteristics of pharmacy students at Umm Al-Qura University

Depression	Abnormal (N = 251)	Normal (N= 149)	X^2	*P-value*	OR	95% C.I.
Variable	**No (%)**	**No (%)**				
Gender						
Male	87 (66.9)	43 (33.1)	1.43	*0.23*	1.31	0.84, 2.03
Female	164 (60.7)	106 (39.3)				
Age						
≤ 21	130 (69.9)	56 (30.1)	7.58	*0.006*	1.78	1.18- 2.69
> 21	121 (56.5)	93 (43.5)				
Marital status						
Single	238 (62.6)	142(37.4)	0.05	*0.83*	0.90	0.35 – 2.32
Married	13 (65.0)	7 (35.0)				
Type of program						
Basic year(RC)	114 (62.3)	69 (37.7)	1.48	0.47	1	
B-Pharm	75 (67.0)	37 (33.0)			1.23	0.75-2.01
Pharm-D	62 (59.0)	43 (41.0)			0.87	0.53-1.42
Educational year						
Second (RC)	55 (63.2)	32 (36.8)	3.64	0.45	1	
Third	59 (61.5)	37 (38.5)			0.93	0.51-1.69
Fourth	44 (59.5)	30 (40.5)			0.85	0.45-1.61
Fifth	66 (61.1)	42 (38.9)			0.91	0.51-1.63
Sixth	27 (77.1)	8 (22.9)			1.96	0.80-4.83
Grade Point Average (GPA)						
< 3.5/4	185 (66.8)	92 (33.2)	6.52	0.01	1.14	0.75 - 1.76
≥ 3.5/4	66 (53.7)	57(46.3)				
Father education						
< University	106 (60.9)	68 (39.1)	0.44	0.50	0.87	0.58 – 1.31
≥ University	145 (64.2)	81 (35.8)				
Mother education						
< University	114 (60.3)	75 (39.7)	0.90	0.34	0.82	0.55 – 1.23
≥ University	137 (64.9)	74 (35.1)				
Residency						
With family	238 (62.8)	141 (37.2)	0.01	0.93	1.04	0.42-2.57
Not with family	13 (61.9)	8 (38.1)				
Academic stress						
Yes	221 (69.3)	98 (30.7)	28.72	0.000	3.83	2.30 - 6.38
No	30 (37.0)	51 (63.0)				
General life satisfaction						
Yes	160 (55.4)	129 (44.6)	24.31	0.000	0.26	0.15- 0.43
No	91 (82.0)	20 (18.0)				
Emotional intelligence						
> average (≥110)	190 (57.8)	139 (42.2)	19.82	0.000	0.22	0.11- 0.45
Average (< 110)	61 (85.9)	**10 (14.1)**				

OR: Odds ratio, C.I.: Confidence interval, RC: Referent category

Table 2. Relationship between depression and habits and lifestyle of pharmacy students at Umm Al-Qura University

Depression	Abnormal (N = 251)	Normal (N= 149)	X^2	P-value	OR	95% C.I.
Variable	**No (%)**	**No (%)**				
Smoking						
Yes	22 (52.4)	20 (47.6)	2.16	*0.14*	0.62	0.33- 1.18
No	229 (64.0)	129 (36.0)				
Physical Activity						
Yes	99 (59.6)	67 (40.4)	1.17	*0.28*	0.79	0.53 –1.20
No	152 (65.0)	82 (35.0)				
Number of exercise Days						
≥3 days/ week	54 (41.2)	77 (58.8)	1.33	0.51	1.28	0.82- 1.98
<3 days / week	12 (34.3)	23 (65.7)			0.95	0.45- 2.03
Not practice (RC)	83 (35.5)	151 (64.5)			1	
Duration of exercising						
≥30 min/ day	76 (55.5)	61(44.5)	6.20	*0.05*	0.66	0.43 - 1.00
<30 min /day	23 (76.7)	7 (23.3)			1.75	0.72 - 4.26
Not practice (RC)	152 (65.2)	81 (34.8)			1	

OR: Odds ratio, C.I.: Confidence interval, RC: Referent category

Table 3. Relationship between anxiety and personal and socio-demographic characteristics of pharmacy students at Umm Al-Qura University

Anxiety	Abnormal (N= 236)	Normal (N=164)	X^2	*P-value*	OR	95% C.I
Variable	**No (%)**	**No (%)**				
Gender						
Male	74 (56.9)	56 (43.1)	0.34	*0.55*	0.88	0.58- 1.35
Female	162 (60.0)	108 (40.0)				
Age						
≤ 21	119 (64.0)	67 (36.0)	3.56	*0.06*	1.47	0.99 – 2.20
>21	117 (54.7)	96 (45.3)				
Marital status						
Single	228 (60.0)	152 (40.0)	3.14	*0.08*	2.25	0.89 – 5.63
Married	8 (40.0)	12 (60.0)				
Type of program						
Basic years(RC)	109 (59.6)	74 (40.4)	0.20	*0.90*	1	
B-Pharm	67 (59.8)	45 (40.2)			1.01	0.63-1.63
Pharm-D	60 (57.1)	45 (42.9)			0.91	0.65-1.47
Educational year						
Second(RC)	34 (39.1)	53 (60.9)	2.56	*0.63*	1	
Third	40 (41.7)	56 (58.3)			1.11	0.62-2.01
Fourth	36 (48.6)	38 (51.4)			1.48	0.79-2.76
Fifth	41 (25)	67 (62)			0.95	0.53-1.70
Sixth	13 (7.9)	22 (62.9)			0.92	0.41-2.07
Grade Point Average (GPA)						
< 3.5 /4	163 (58.8)	114 (41.2)	0.01	*0.93*	0.99	0.64 -1.52
≥ 3.5 /4	73 (59.3)	50 (40.7)				
Father education						
< University	100 (57.5)	74 (42.5)	0.29	*0.58*	0.89	0.59 -1.37
≥ University	136 (60.2)	90 (39.8)				
Mother education						
< University	110 (58.2)	79 (41.8)	0.09	*0.75*	0.94	0.63- 1.40
≥ University	126 (59.7)	85 (40.3)				

Anxiety	Abnormal (N= 236)	Normal (N=164)	X^2	*P-value*	OR	95% C.I
Residency						
With family	226 (59.6)	153 (40.4)	1.18	*0.27*	1.63	0.67 -3.92
Not with family	10 (47.6)	11 (52.4)				
Academic stress						
Yes	214 (67.1)	105 (32.9)	42.56	*0.000*	5.47	3.17 – 9.40
No	22 (27.2)	59 (72.8)				
General life satisfaction						
Yes	154 (53.1)	136 (46.9)	15.16	*0.000*	0.39	0.24 – 0.63
No	82 (74.5)	28 (25.5)				
Emotional intelligence						
> average (≥110)	187 (56.8)	142 (43.2)	3.58	0.05	0.59	0.34- 1.02
Average (< 110)	49 (69.0)	22 (31.0)				

OR: Odds ratio, C.I.: Confidence interval, RC: Referent category

Table 4. Relationship between anxiety and habits and lifestyle of pharmacy students at Umm Al-Qura University

Anxiety	Abnormal (N= 236)	Normal (N=164)	X^2	*P*-value	OR	95% C.I
Variable	**No (%)**	**No (%)**				
Smoking						
Yes	27 (64.3)	15 (35.7)	0.54	*0.46*	1.28	0.66 - 2.49
No	209 (58.4)	149 (41.6)				
Physical Activity						
Yes	70 (42.2)	96 (57.8)	0.16	0.69	1.08	0.72- 1.69
No	94 (40.2)	140 (59.8)				
Number of exercise Days						
≥3 days/ week	74 (56.5)	57 (43.5)	1.01	0.60	1.30	0.62- 2.73
<3 days / week	23 (65.7)	12 (34.3)			1.50	0.69- 3.27
Not practice (RC)	139 (59.4)	95 (40.6)			1	
Duration of exercising						
≥30 min/ day	75 (54.7)	62 (45.3)	2.64	0.26	0.80	0.53-1.25
<30 min /day	21 (70.0)	9 (30.0)			1.55	0.68- 3.53
Not practice (RC)	140 (60.1)	93(39.9)			1	

OR: Odds ratio, C.I.: Confidence interval, RC: Referent category

Table 5. Relationship between stress and personal and socio-demographic characteristics of pharmacy students at Umm Al-Qura University

Stress	Abnormal (N=197)	Normal (N=203)	X^2	*P-value*	OR	95% C.I.
Variable	**No (%)**	**No (%)**				
Gender						
Male	60 (46.2)	70 (53.8)	0.74	*0.39*	0.83	0.55- 1.27
Female	137 (50.7)	133 (49.3)				
Age						
≤ 21	109 (58.6)	77 (41.4)	12.16	*0.00*	2.03	1.36 - 3.02
>21	88 (41.1)	126 (58.9)				
Marital status						
Single	185 (48.7)	195(51.3)	0.97	*0.32*	0.63	0.25- 1.58
Married	12 (60)	8 (40)				
Type of program Basic years (RC)	90 (49.2)	93 (50.8)	0.46	*0.79*	1	
B-Pharm	57 (50.9)	55 (49.1)			1.07	0.67- 1.71
Pharm-D	56 (53.3)	49 (46.7)			1.18	0.67- 1.71
Table Educational year						
Second (RC)	38 (43.7)	49 (56.3)	5.73	*0.21*	1	
Third	52 (54.2)	44 (45.8)			1.52	0.85- 2.73
Fourth	37 (50.0)	37 (50.0)			1.08	0.59- 1.99

Stress	Abnormal (N=197)	Normal (N=203)	X^2	*P-value*	OR	95% C.I.
Fifth	62 (57.4)	46 (42.6)			1.74	0.98- 3.07
Sixth	14 (40.0)	21 (60.0)			0.89	0.39- 1.91
Grade Point Average (GPA)						
<3.5	142 (51.3)	135 (48.7)	1.46	*0.23*	0.76	0.50- 1.18
≥3.5	55 (44.7)	68 (55.3)				
Father education						
< University	87 (50)	87 (50)	0.07	*0.79*	1.06	0.71-1.57
≥University	110 (48.7)	116 (51.3)				
Mother education						
< University	88 (46.6)	101(53.4)	1.03	*0.31*	0.82	0.55- 1.21
≥University	109 (51.7)	102 (48.3)				
Residency						
With family	186 (49.1)	193 (50.9)	0.08	*0.76*	0.87	0.36- 2.11
Not with family	11 (52.4)	10 (47.6)				
Academic stress						
Yes	181 (56.7)	138 (43.3)	35.35	*0.00*	5.33	2.95- 9.61
No	16 (19.8)	64 (80.2)				
General life satisfaction						
Yes	123(42.6)	166 (57.4)	19.71	*0.00*	0.36	0.23-0.57
No	74 (66.7)	37 (33.3)				
Emotional intelligence						
> average (≥110)	150 (45.6)	179 (54.4)	9.19	0.002	0.48	0.25- 0.73
Average (< 110)	47 (66.2)	24 (33.8)				

Table 6. Relationship between stress and habits and lifestyle of pharmacy students

Stress	Abnormal (N=197)		Normal (N=203)		X^2	*P-value*	OR	95% C.I.
Variable	**No**	**(%)**	**No**	**(%)**				
Smoking								
Yes	23 (54.8)		19 (45.2)		0.57	*0.45*	1.28	0.67-2.43
No	174 (48.6)		184 (51.4)					
Physical Activity								
Yes	78 (47)		88 (53)		0.58	*0.45*	0.86	0.58-1.28
No	119 (50.9)		115(49.1)					
Number of exercise Days								
≥3 days/ **week**	57 (43.5)		74(56.5)		4.44	*0.11*	0.76	0.49-1.16
<3 days / week	22 (62.9)		13 (37.1)				1.66	0.80-3.46
Not practice (RC)	118 (50.4)		116 (49.6)				1	
Duration of exercising								
≥30 min/ day	57(41.6)		80 (58.4)		8.68	*0.01*	0.68	0.45 – 1.05
<30 min /day	21 (70)		9 (30)				2.23	0.98 – 5.09
Not practice (RC)	119 (51.1)		114(48.9)				1	

Table 7. Logistic regression analyses of the predictors of depression, anxiety and stress among pharmacy students at Al-Qura University

	Depression			
Variable	**B**	***P-value***	**aOR**	**95 % C.I.**
High EL score (≥110)	-1.694	0.000	0.194	0.09 – 0.42
Academic stress (Yes)	1.375	0.000	3.95	2.23 – 7.02
General life satisfaction	- 1.06	0.000	0.35	0.19 - 0.61
Constant	**-**2.21			

Anxiety				
Variable	**B**	**P-value**	**aOR**	**95 % C.I.**
Academic Stress	1.57	0.000	4.82	2.78 - 8.37
General life satisfaction	- 0.76	0.003	0.47	0.28 - 0.78
Constant	**-1.14**			

Stress				
Variable	**B**	**P-value**	**aOR**	**95 % C.I.**
Academic stress (Yes)	1.680	0.000	4.39	2.62 – 9.29
High EL score (≥110)	- 0.940	0.003	0.40	0.21 - 0.72
General life satisfaction	-0.72	0.005	0.49	0.30 - 0.81
Age (> 21)	-0.48	0.029	0.62	0.40 - 0.96
Duration of exercising				
< 30 minutes/ day	-0.9	0.05	0.40	0.17- 0.98
≥ 30 minutes/ day	-1.27	0.007	0.28	0.11- 0.70
Not practicing (RC)			1	
Constant	**1.69**			

aOR: Adjusted Odds Ratio C.I.: Confidence interval

4. DISCUSSION

Global mental health is of growing concern, with increasing benefits from worldwide efforts for the sustainable development of mental health programs [8]. Analysis of DASS-21 in the current study revealed that the prevalence of depression, anxiety, and stress among pharmacy students were 62.8 %, 59.0 %, and 49.2 %, respectively.

Such rates are considered high rates. Previously done studies showed also that the students from the medical field, as medicine and pharmacy, generally had high levels. Abdel Wahed, et al. conducted a study using the same tool among medical students from Fayoum University, Egypt. They reported that the corresponding rates were 60.8%, 64.3%, and 62.4%, respectively [14]. Their rates are comparable to the current rates regarding depression and anxiety. However, they reported a higher rate of stress compared to our study. The cause of such discrepancy may be due to differences in the target populations or cultural differences. Similarly, the study from Najran University, Saudi Arabia, found that the prevalence of depression, anxiety, and stress among male medical students were 59%, 71%, and 61%, respectively [15]. On the other hand, Hashmi, et al., conducted a study in Pakistan using the Aga Khan University Anxiety and Depression Scale (AKUADS), and found that symptoms of anxiety and depression were exist among 45.5% of medical students [1]. The cause of the much lower rate from the Pakistani compared to the current study may be due to differences between the target populations or the used tools.

Regarding gender, males had a higher rate of abnormal depression than females ($P > 0.05$). This result agrees with the findings of Demirbatir, et al., who also reported an absence of significant association between gender and depression among 1088 Turkish medical and music college students [2]. Cheung, et al. found that male nursing students from Hong Kong suffered more from depression than females [3]. On the other hand, the study of Bore, et al., found that Australian female medical students reported higher levels of depression compared to males, but the differences were not significant [4].

Our results showed that female pharmacy students had a higher level of stress and anxiety compared to males ($P > 0.05$). Females may be more vulnerable to negative emotion compared to males with an increased risk of anxiety and stress [8]. A study among Danish medical students found that females reported higher

levels of stress compared to male medical students, but the differences were not significant [2]. Similar result obtained among 4000 doctor of pharmacy (Pharm.D) students [3]. The sex differences revealed from our results and from the previous studies may be due to multifactorial causes. Females are better at recognizing emotions and expressing themselves more easily, explaining the different behavioral responses which may lead to increased psychological disorders among them [21]. Furthermore, some theories explained the gender difference in the prevalence of stress and anxiety that it could be due to two main biological factors. The first factor is due to stress hormones disorders (adrenaline and cortisol); which affect stress and anxiety level. The second factor is related to sex hormones (estrogen and progesterone). The complex of estrogen and progesterone across the menstrual cycle may increase vulnerability to develop anxiety disorders among females [22,23,24]. In addition, females may suffer more from stress because they are looking for the ideal personality. However, male students are more able to control impulses and more able to minimize stress [25]. Furthermore, the relation of environmental factors such as social, cultural, and economic differences may also affect the DASS score [26].

Concerning age, younger students (≤ 21) in the current study suffered more from each of depression, anxiety and stress. Students in their early years in the medical fields may have an increased academic pressure, many studying hours, and having a complexity of the learned subjects. Then they tried to adapt to their college environment. Another study of Cheung, et al., found that age was associated with stress and anxiety among Hong Kong nurses [27] Furthermore, a meta-analysis (2018) done for 27 cross-sectional studies composed of 8,918 nurse students reported that younger students have the highest depression prevalence score [28].

On the other hand, some other studies found the opposite association between age and phycological distress among healthcare students. The study of Abdel Wahed, et al. suggested that older medical students suffered more from stress, anxiety, and depression [14]. Furthermore, the study of Shamsuddin, et al., found that older students aged between 20–24 years are more likely to be depressed, anxious, and stressed than younger students < 20 years [29]. The cause of such discrepancies between the previous results and ours may be attributed to differences between the target populations.

The current study's results found that married students had a higher prevalence of depression and stress compared to single students (but did not show any statistically significant association). Cheung, et al., also found that higher depression levels among married nursing residence [27]. The lower rates of psychological traits among single than married students may be due to social support which single students are surrounded with (e.g. caring and support from family and friends) [30]. Our results agree with the results from the previous studies. An American study done among 374 university students at Franciscan University also didn't find any significant relationship between marital status and DASS [31]. Similarly, another Egyptian study done among the first year medical students didn't find any association between marital status and level of DASS [32]. Furthermore, a Ghanaian study failed to find a relationship between marital status and depression level among 270 college students [33]. On the other hand, an Iranian study conducted among 10,000 adults at Yazd Greater Area in 2019 found a significant difference among married as they recorded higher DASS level compared to others [34]. This discrepancy between the current and the Iranian study may be due to differences between both target populations.

Our results showed that academic achievement had a statistically significant negative association with depression. Students with a higher GPA (GPA ≥ 3.5/4) had a lower level of depression compared to others. This may be because students with lower GPA may be afraid of academic failure and this can negatively influence the student's psychological health. Our result coincides with the previous studies that found that high depression level was correlated with poorer academic performance among college students [35]. The results of the present study showed that academic stress had significant positive associations with depression, anxiety and stress. Academic stress was also a predictor of all these illnesses. These findings stand in the same line with ideas of the previous studies that suggested that students' academic stress is a significant predictor for depression. Similarly, Kang, et al., reported that nursing and undergraduate students who suffered from a high level of academic stress had a higher level of depression [36].

The current study revealed that students who practiced physical activity for a longer duration (≥ 30 minutes) had a lower risk of having stress. They had also a lower prevalence of depression. These results agree with the Hong Kong study [27]. Students who exercised ≥ 30 minutes /day had significantly lower levels of stress and depression compared to others. Correspondingly, Zwan, et al., conducted a randomized controlled trial (RCT) among 76 adults at the University of Amsterdam. They reported that 20 minutes of physical exercise decreased the stress and stress-related symptoms such as symptoms of anxiety and depression; when carried out in a self-directed way [37]. Anxiety and Depression Association of America (ADAA) recommended physical activity as one of the coping strategies for stress. This can reduce stress hormones (adrenaline and cortisol) while stimulating the production of endorphins. This can lead to a high euphoric state (during or after exercising) which reduces the anxious and depressed moods [38]. Additionally, physical activity has an important social benefit, as it also has a positive effect on DASS [39].

There is a growing body of evidence that mindfulness exerts its beneficial effects on psychological wellbeing by influencing EI [40].

Our finding verified that depression was negatively associated with EI. Students who obtained a higher EI score had significantly a lower prevalence of depression. EI was the first predictor of decreasing depression among pharmacy students.

Students who obtained a higher EI score also had a lower risk of having stress. Meng, et al., (2018) suggested that high EI improved the perceived stress among nursing students [41]. The study of Ibrahim et al., (2017) suggested that having higher EI was negatively associated with stress [12]. Likewise, Foster et al., suggested that EI had a significant negative correlation with stress levels between pharmacy and nursing undergraduate students [42]. The study of Ruiz-Aranda, et al., found that healthcare students with high EI had lower stress levels; which positively influenced life satisfaction and happiness [43].

The current study suggested that general life satisfaction was negatively associated with depression, anxiety and stress. It is one of the negative predictors of these three mental illnesses, after controlling other confounding factors. Previous studies showed similar findings. Stankov suggested that higher level of depression correlated with low level of life satisfaction among Asian adolescents [44]. These results could be explained by the mediator role of self-esteem which enhanced by emotional awareness and social support, and this enhanced by abilities which can recognize and manage emotions resulting in an increased life satisfaction also case decreasing psychological distresses [45].

5. CONCLUSION

The prevalence of depression, anxiety, and stress among pharmacy students in the current study were high (62.8%, 59.0%, and 49.2%, respectively). Younger students suffered more from stress compared to older participants.

In regression analysis, general life satisfaction is an important predictor for decreasing depression, anxiety, and stress levels. Duration of exercise is a significant predictor for the reduction of stress. Academic stress is an important predictor for increasing depression, anxiety, and stress levels. Better EI was associated with reducing depression and stress among pharmacy students.

Screening programs are needed for detecting depression, anxiety, and stress among pharmacy students. Proper case management is needed. Psychosocial and academic support services are needed for better management of academic stress. Stress management courses are required for pharmacy students (and other health specialties). Training courses and educational programs need to be conducted for improving the EI of pharmacy students. Encouraging practicing a longer duration of physical activities is needed. This can help students to cope with stress and avoid mental illnesses. Future longitudinal studies are required.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by

the producing company rather it was funded by personal efforts of the authors.

CONSENT AND ETHICAL APPROVAL

The study was conformed to the ethical standards of the Helsinki Declaration and approved by the Institutional Review Board (IRB) of King Abdulaziz University (KAU), with a Reference Number: 151-18 dated 22/3/2018. The ethical approval was obtained also from the Ethics Committee Board of Pharmacy at Umm Al-Qura University, with a project number of 14907 dated 22/4/2018. Administrative approvals were taken. Pharmacy students at Umm Al-Qura University were informed with a brief description of the study. An informed written consent was completed from each accepted student when they enrolled in the study. There is confidentiality and freedom of participation.

ACKNOWLEDGEMENT

All authors would like to thank all officials who facilitated the conduction of the study and all students who participated in it.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/78557